Climate Change and Development Series

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# DECARBONIZING DEVELOPMENT

## Three Steps to a Zero-Carbon Future

# Motivation

- A lot of talk about climate stabilization but limited awareness of implications
- Planning targeted to the medium term
- Debate focusing on what should be done without enough discussion of the obstacles to do so – especially in political economy terms…

# Self evident?

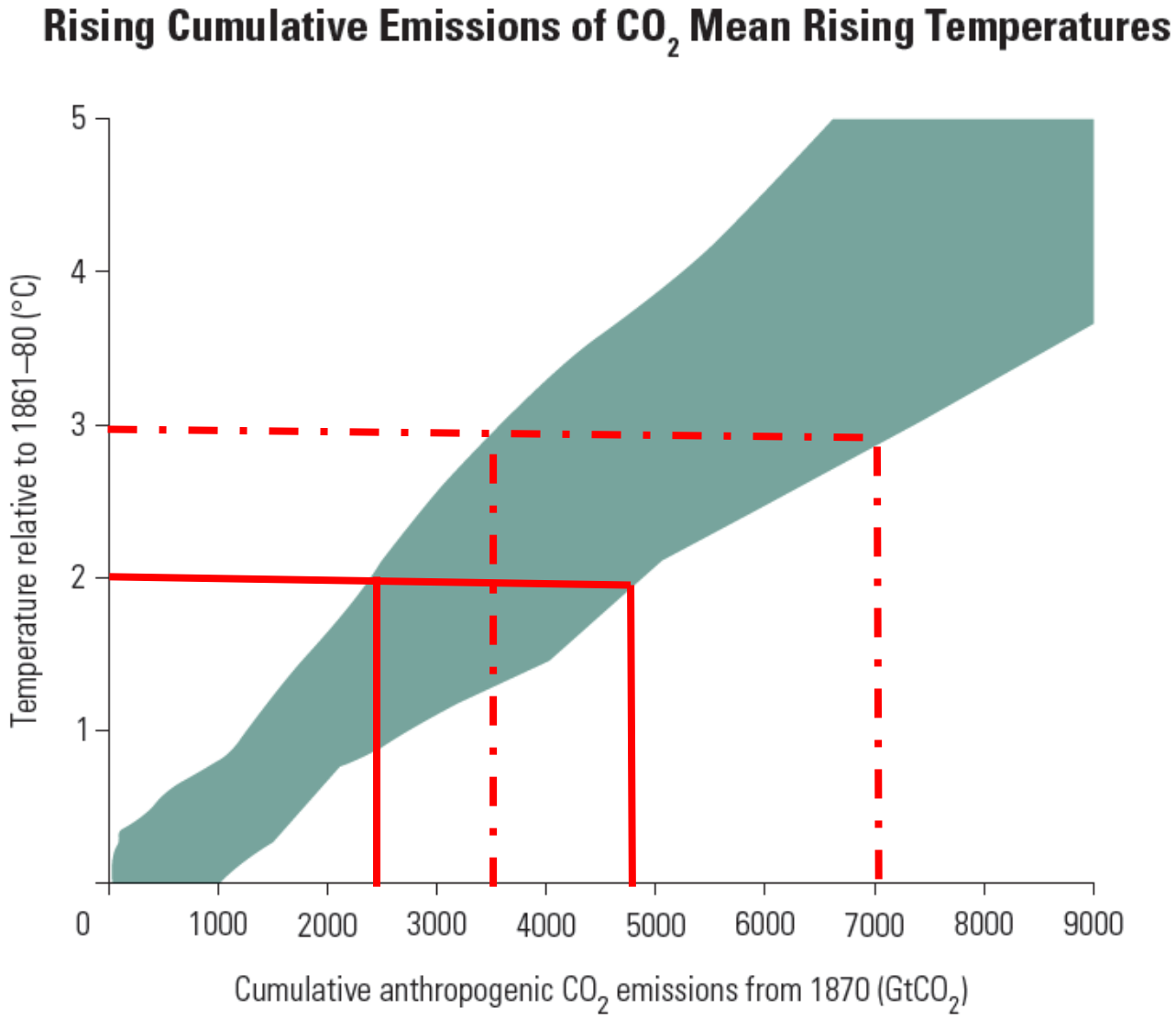
Stabilizing the Climate

=

Full Decarbonization

# The future is carbon free

- For any temperature limit, there is a maximum $CO_2$ budget
- So $CO_2$ emissions have to go to zero at some point
- The only question is *when?*

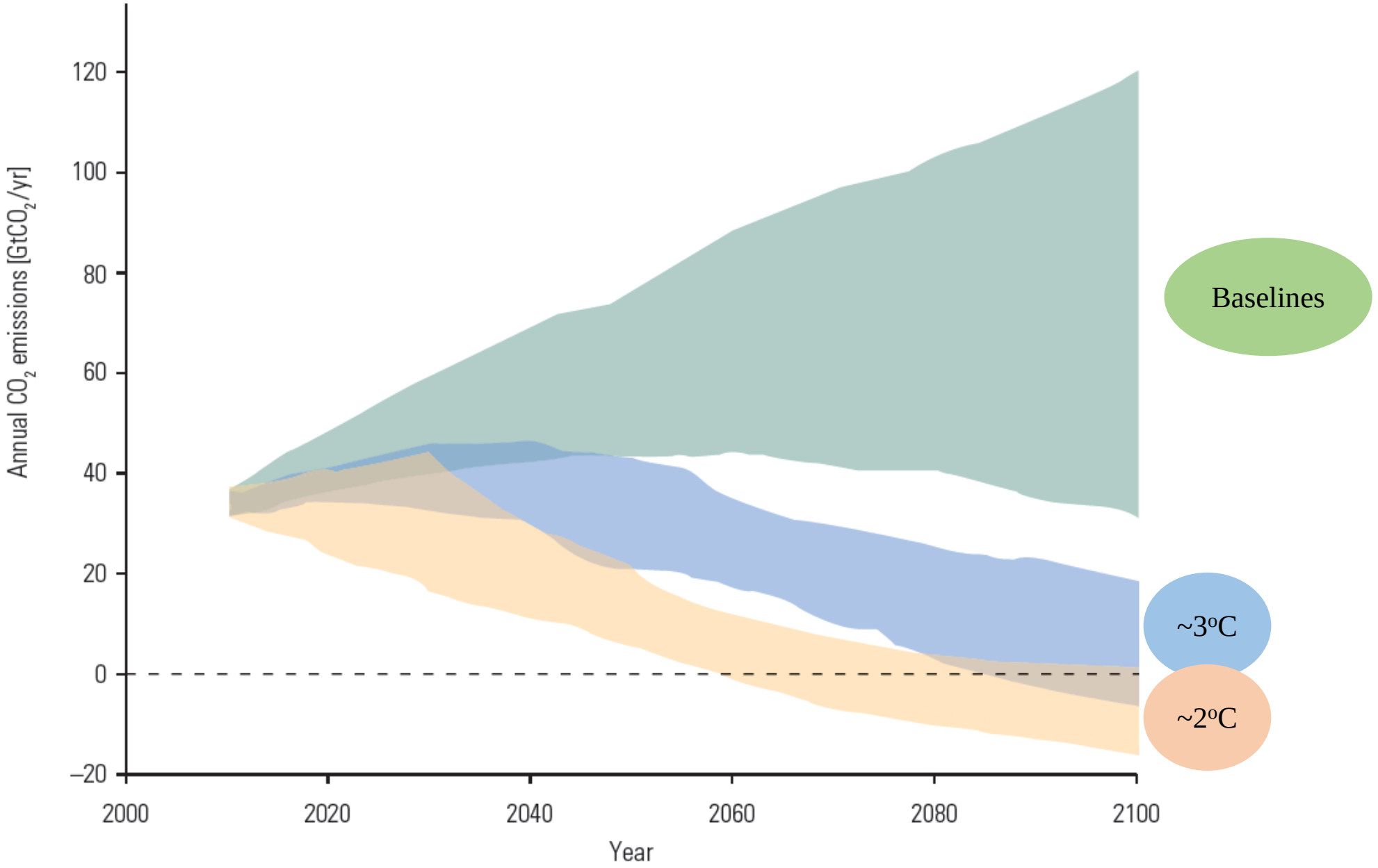


# Three steps to a zero-carbon future

- **Step 1 – Plan ahead for a future with *zero* emissions**
- **Step 2 - Getting carbon prices *and* *complementary policies* right**
- **Step 3 - Mind the *political* economy and *smooth the transition* for those who stand to be most affected**

# Step 1 – Plan ahead for a future with zero emissions

# How fast should we bring emissions to zero?

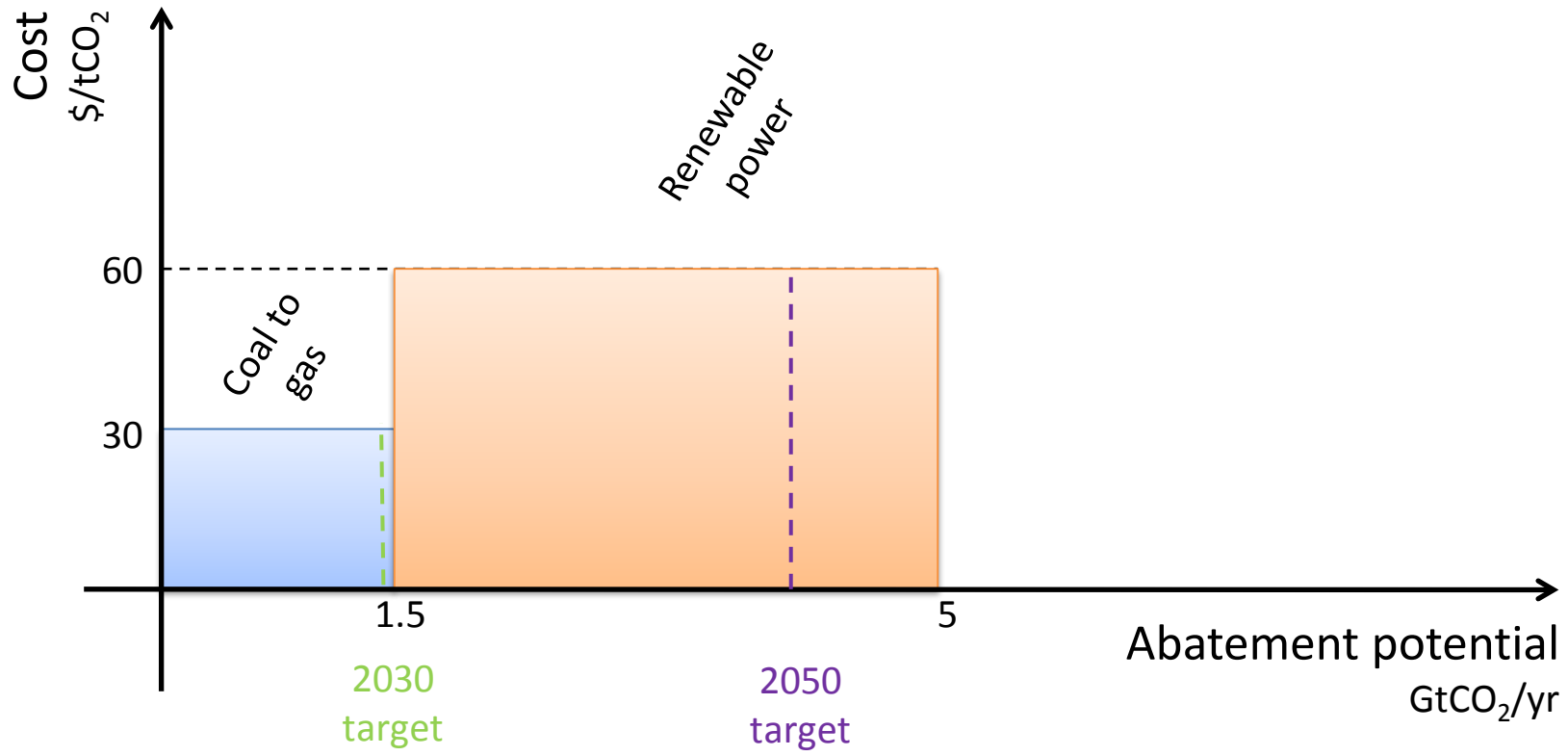


# Sectoral indicators help track progress along the four pillars of decarbonization

**TABLE 3.2 Examples of Possible Sectoral Targets for Tracking Progress toward the Decarbonization End Goal**

| Pillar | Sector | Example of target | Rationale |
|---|---|---|---|
| **Decarbonization of electricity production** | Power generation | Produce at least 30% of electricity from renewable sources by 2025 | This type of target prevents the power sector from locking into intermediate solutions, such as gas power or enhanced coal power, which do not have the potential to fully decarbonize the power sector. It also supports the development of the required technologies (e.g., solar photovoltaic and smart grid able to manage intermittency). |
| **Efficiency** | Transport | Get 50% of the population to commute by public transport (bus) in 2025 in a city | At city scale, this target helps reduce energy expenditures, congestion, and local pollution, in addition to lowering $CO_2$ emissions and building zero-carbon cities. Accessible public transit can also influence household localization choices, which have long-term consequences on energy and carbon efficiency. |
| | Building | Build 50% of zero-energy buildings in 2030 | Zero-energy buildings are needed for full decarbonization, and reduce energy bills and increase comfort. Early action is needed given the long lifetime of buildings. |
| | Cities | Plan for dense cities | Urban sprawl is mostly irreversible and locks inhabitants into carbon-intensive pathways as it makes it much more difficult to develop viable public transit systems. |
| **Fuel shifting/ substitution** | Transport | Reach 1% of electric vehicles in 2015 | Favoring electric vehicles prevents locking into marginal improvements of combustion engines, and contributes to total decarbonization as long as the electricity sector is being decarbonized at the same time. |
| | Buildings/ forestry | Use 20% of sustainable wood in new building structure by 2025 | Wood construction contributes to reaching zero carbon, if wood is produced sustainably. It is one of the options to reduce emissions from construction materials. |
| **Natural carbon sinks** | Forestry | Stop deforestation by 2017 | Deforestation (and associated loss of ecosystem services) is largely irreversible, so action in this domain cannot wait. |

# Reaching a short-term target through cheap options (supply curve approach) would cause **carbon-intensive lock-in**




Why should we not comply to the 2030 target using only the cheap coal to gas?



*Vogt-Schilb, A., S. Hallegatte, (2014), 'Marginal Abatement Cost Curves and the Optimal Timing of Mitigation Measures'*

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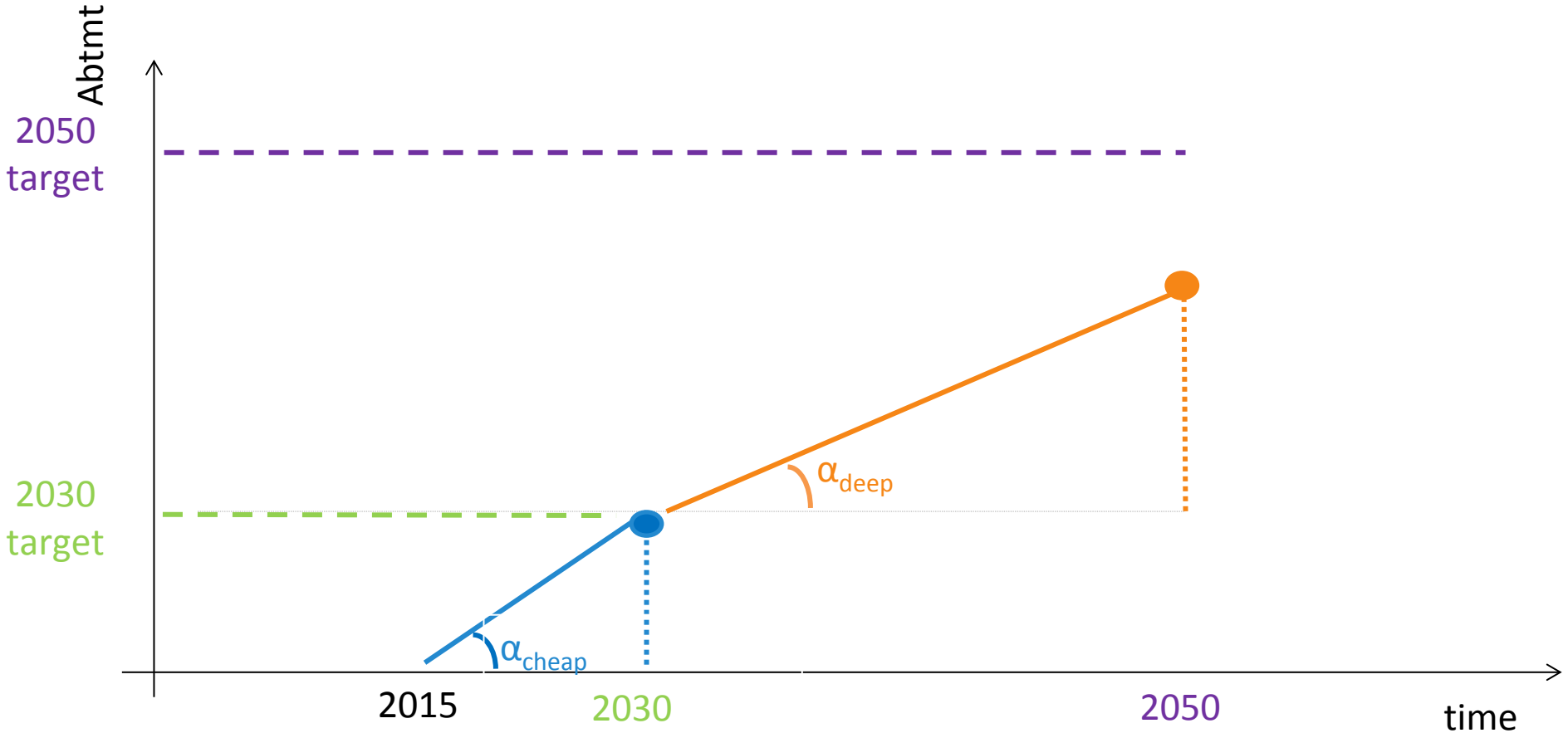
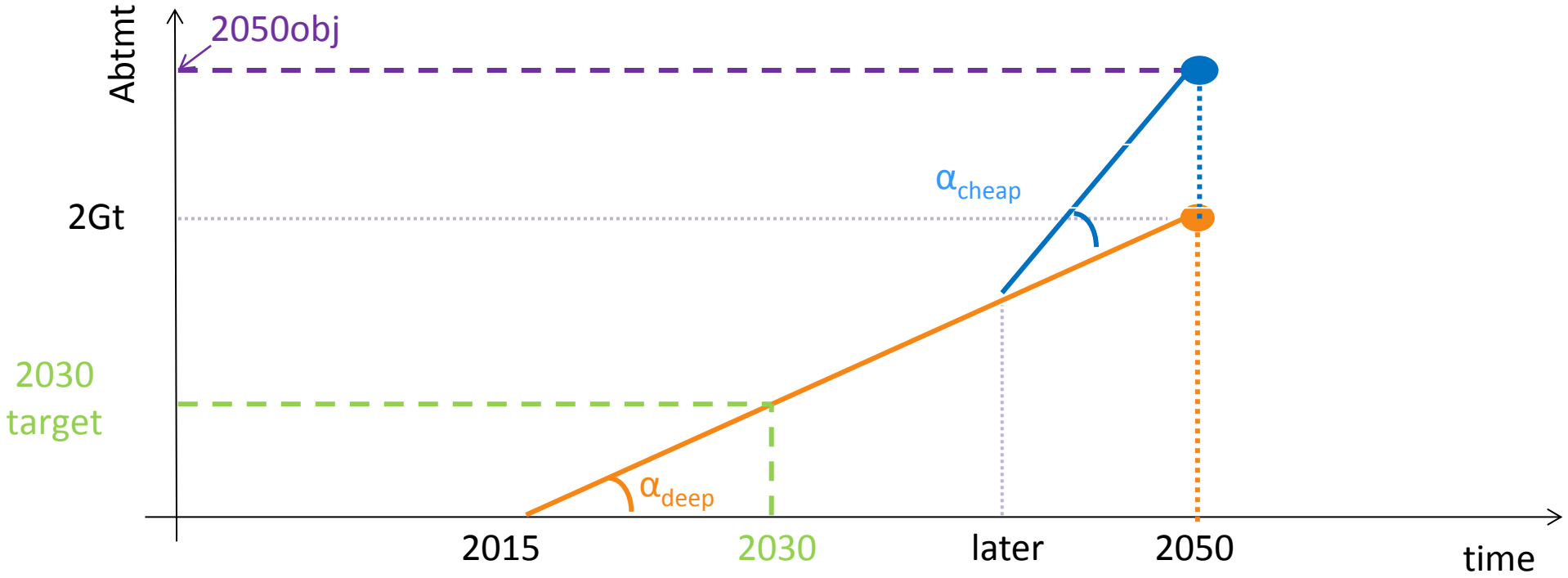



1. The 2020 target is reachable by implementing only the cheap option (as switching from coal to gas).
2. In 2020, attention goes to the 2050 target. Implementing deep (e.g. renewable electricity ) at the maximum speed does not allow the reach 2050 target



*Vogt-Schilb, A., S. Hallegatte, (2014), 'Marginal Abatement Cost Curves and the Optimal Timing of Mitigation Measures'*

# Optimal **short-term action** depends on the **long-term target and implementation speed**




1. Assume that one knows that the optimal abatement from renewable power in 2050 should be 2Gt
2. Installing that much solar power takes time.
3. We should start to implement solar plants now
4. Cheaper but faster-to-implement options required in 2050 may enter later
5. The **short term target** is met with the **expensive option (what policy can we use?)**

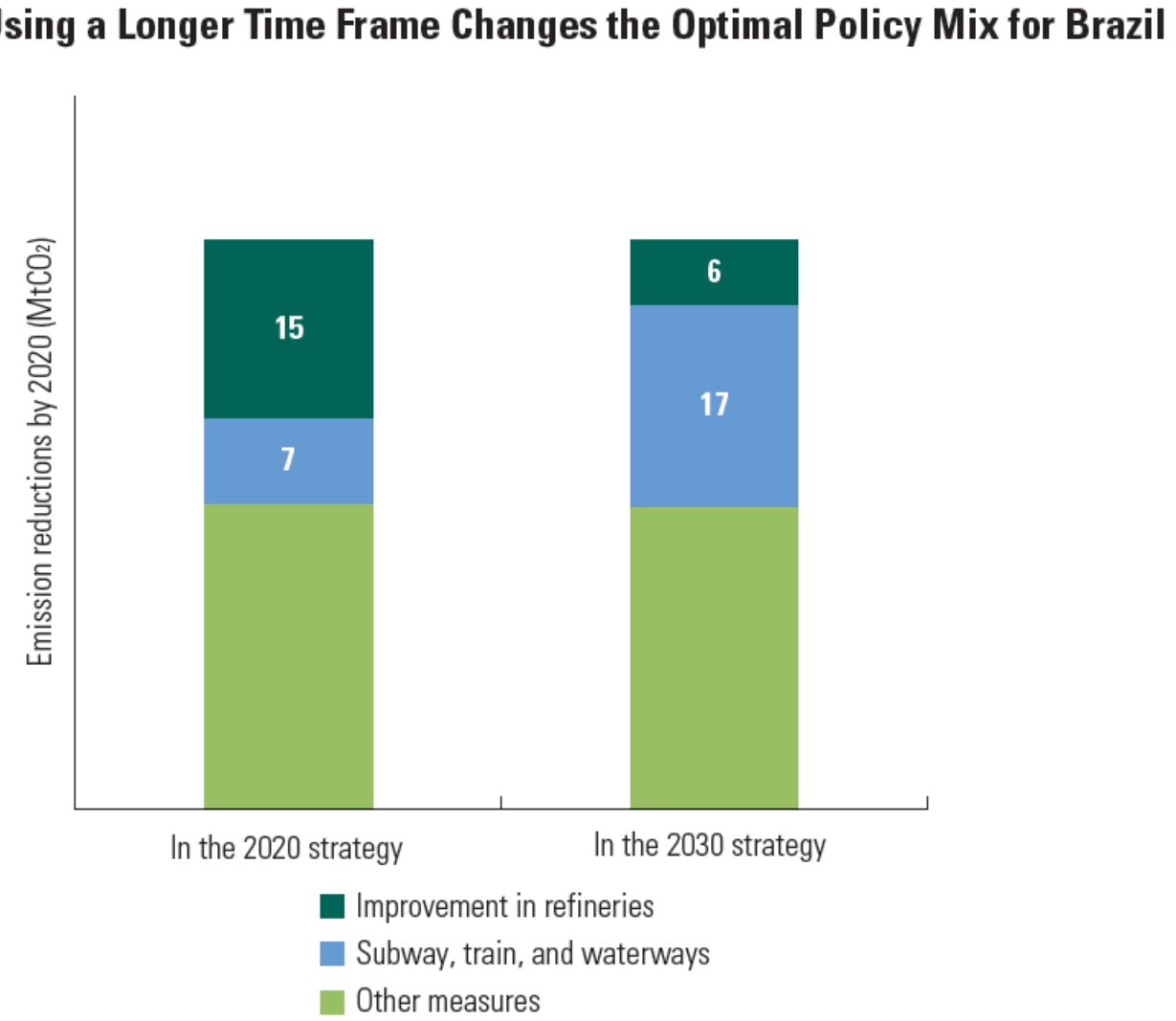


*Vogt-Schilb, A., S. Hallegatte, (2014), 'Marginal Abatement Cost Curves and the Optimal Timing of Mitigation Measures'*

# The zero-emission goal determine immediate needs for action

- In a case study on Brazil, we highlight the difference in strategy between a marginal and a structural change

- To get to zero emissions, we need to start now to:
  - Develop and test needed technologies
  - Redirect investments in long-lived equipment
  - Avoid lock ins in land use and urban development



- *Beware of marginal changes that do not lead to the long-term goal.*
- *Progress is required on high-potential measures, and in each of the four pillars*

# Sectoral indicators help track progress along the four pillars of decarbonization

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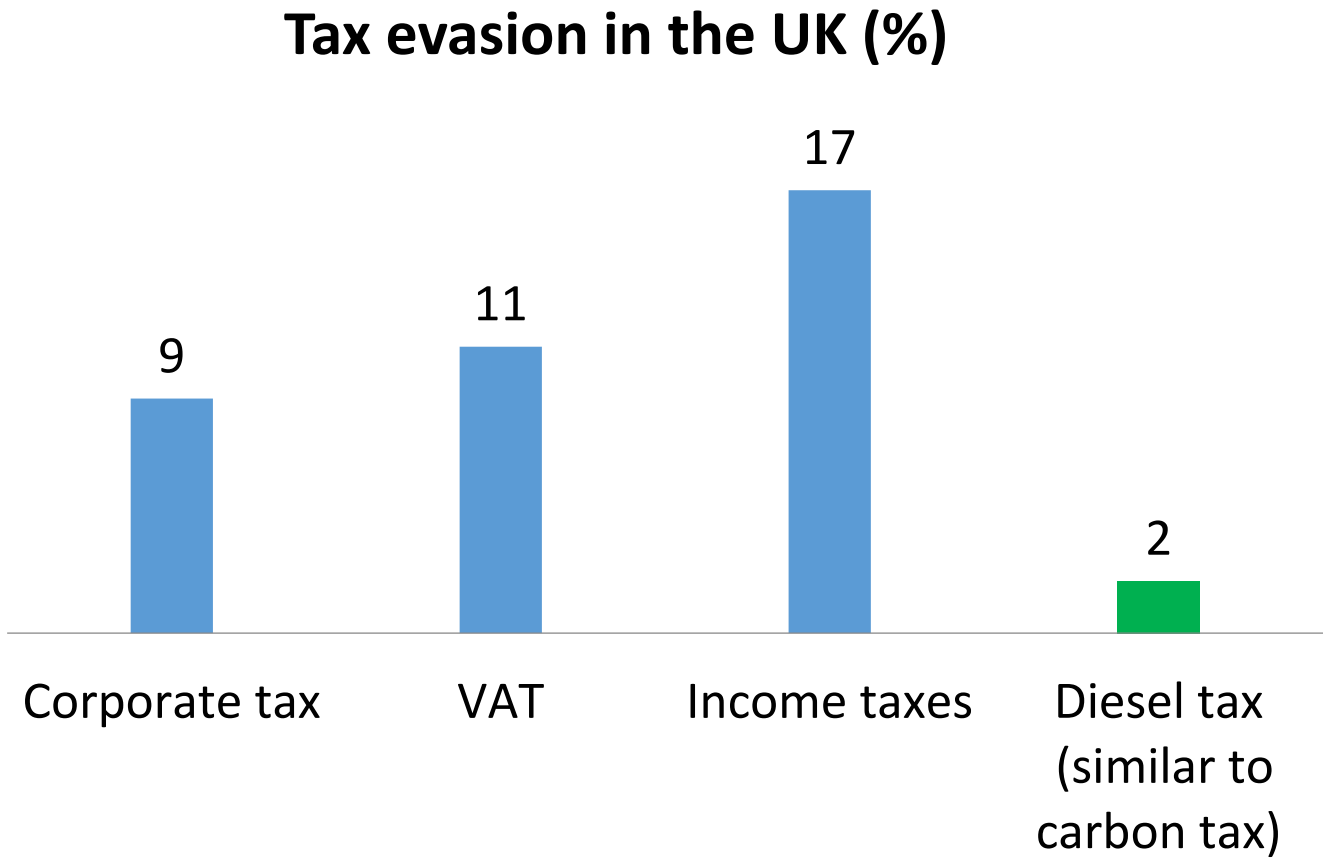
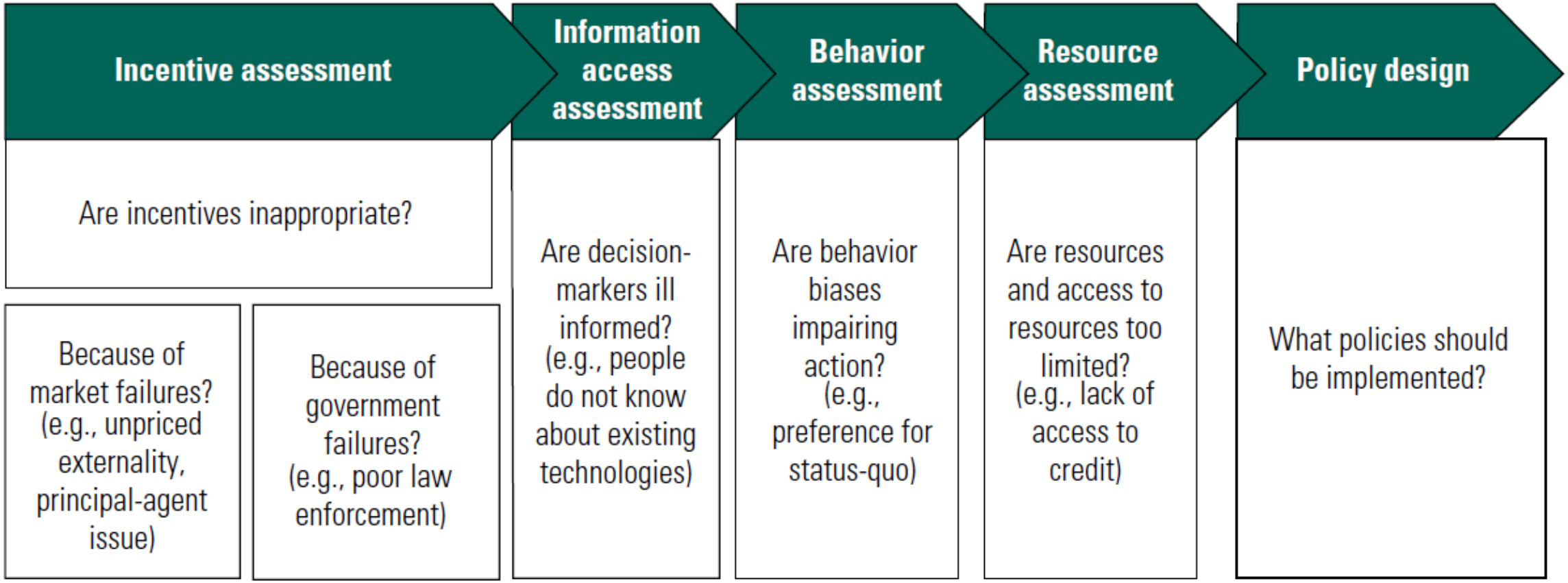
# Step 2 - Getting carbon prices *and complementary policies* right

# Tax the bads, not the goods!

- Getting prices right is good fiscal policy: a carbon tax can generate revenues efficiently
- Better to tax energy consumption or emissions rather than jobs or investments
- And evasion is more difficult
- This is even more important in low-income countries with weaker institutions



# Pricing is not enough: decarbonization faces many obstacles



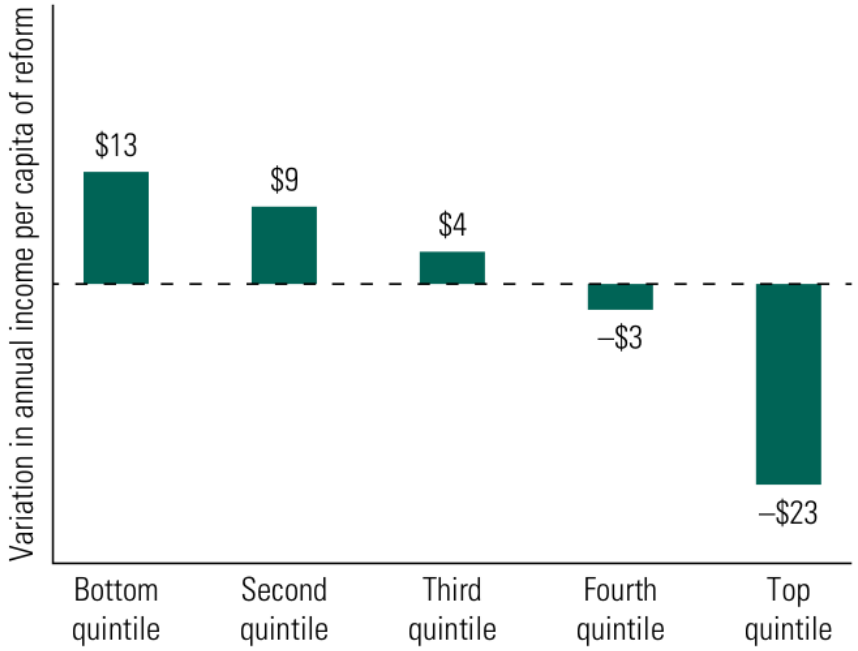

*Source:* Adapted from World Bank (2013).

# Climate policies will be successful only if they contribute to development and poverty reduction

- Fossil fuel subsidies reform and carbon pricing can be designed so the poor people benefit

**FIGURE 0.5 Using Fossil Fuel Subsidy Resources for Universal Cash Transfers Benefits Poor People**

*(Impact of recycling $100 from a fossil fuel subsidy to a universal cash transfer)*




*Source:* Based on Arze del Granado, Coady, and Gillingham (2012).

*Note:* The figure shows the impact of reducing the fossil-fuel subsidy budget by $100 and distributing the savings as a universal cash transfer.

Climate Change and Development Series

# DECARBONIZING DEVELOPMENT

## Three Steps to a Zero-Carbon Future

## OVERVIEW

See the full report at
www.worldbank.org/decarbonizingdevelopment

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Julie Rozenberg
Ulf Narloch
Tom Kerr

DECARBONIZING DEVELOPMENT

**Decarbonizing Development: Planning Ahead for a Future with Zero Emissions**

96412

DECARBONIZING DEVELOPMENT

**Decarbonizing Development: Getting Carbon Prices and Policies Right**

96413

DECARBONIZING DEVELOPMENT

**Decarbonizing Development: Smoothing the Transition and Protecting the Poor**

# Muchas gracias

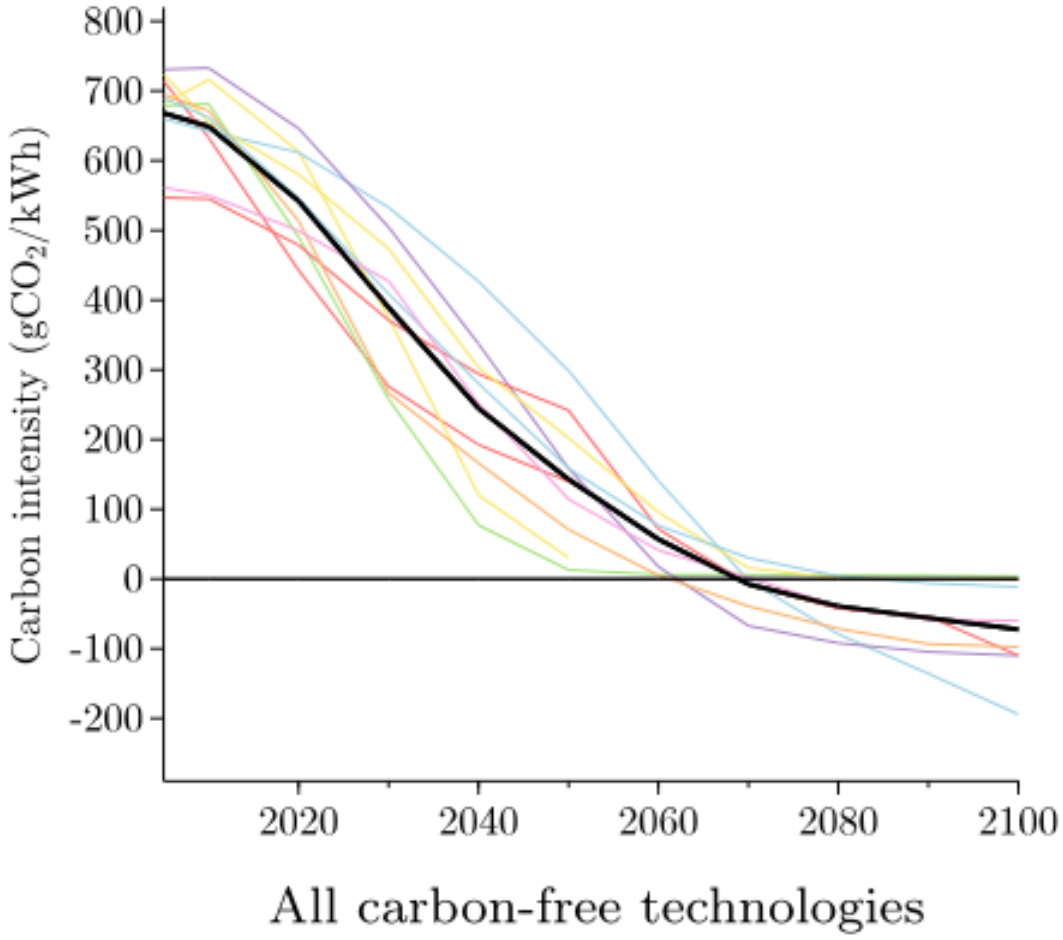
All of that is on www.worldbank.org/climate/decarbonization

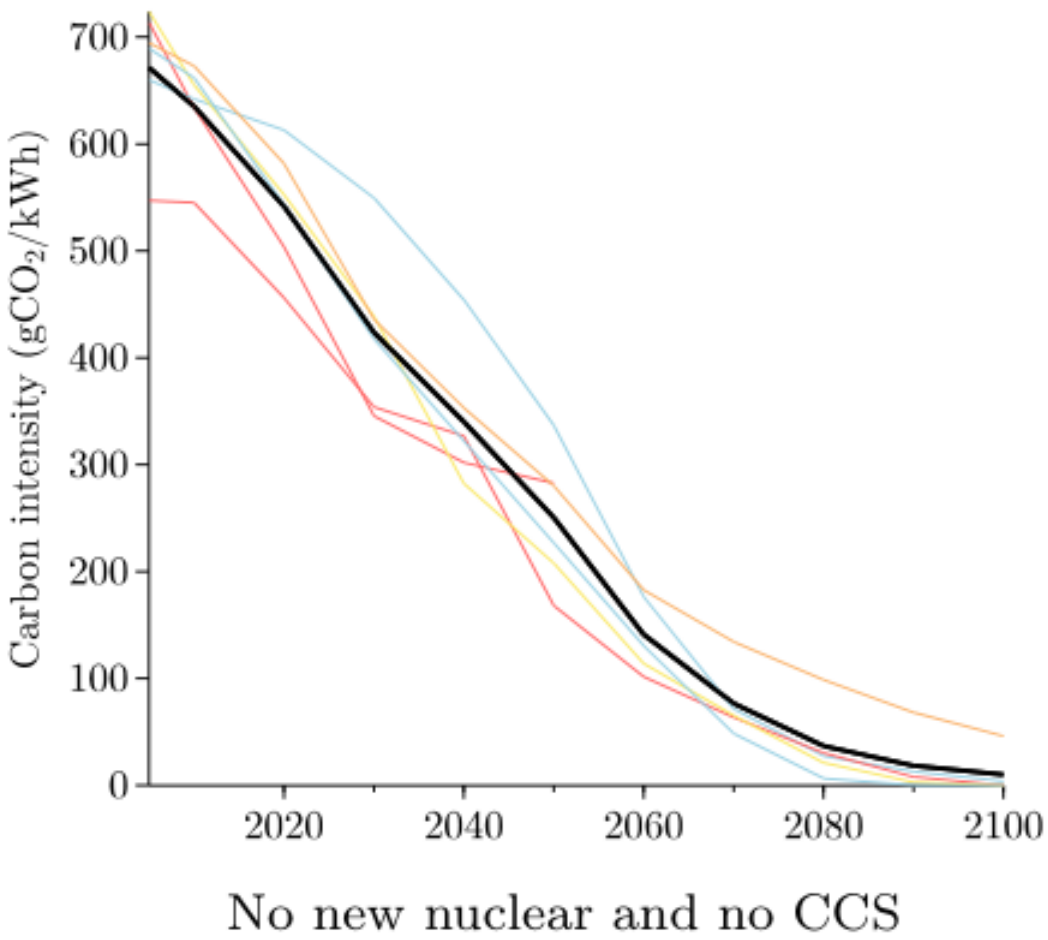
What's next? A report on "Poverty and Climate Change," expected in October.

Adrien Vogt-Schilb, avogtschilb@worldbank.org

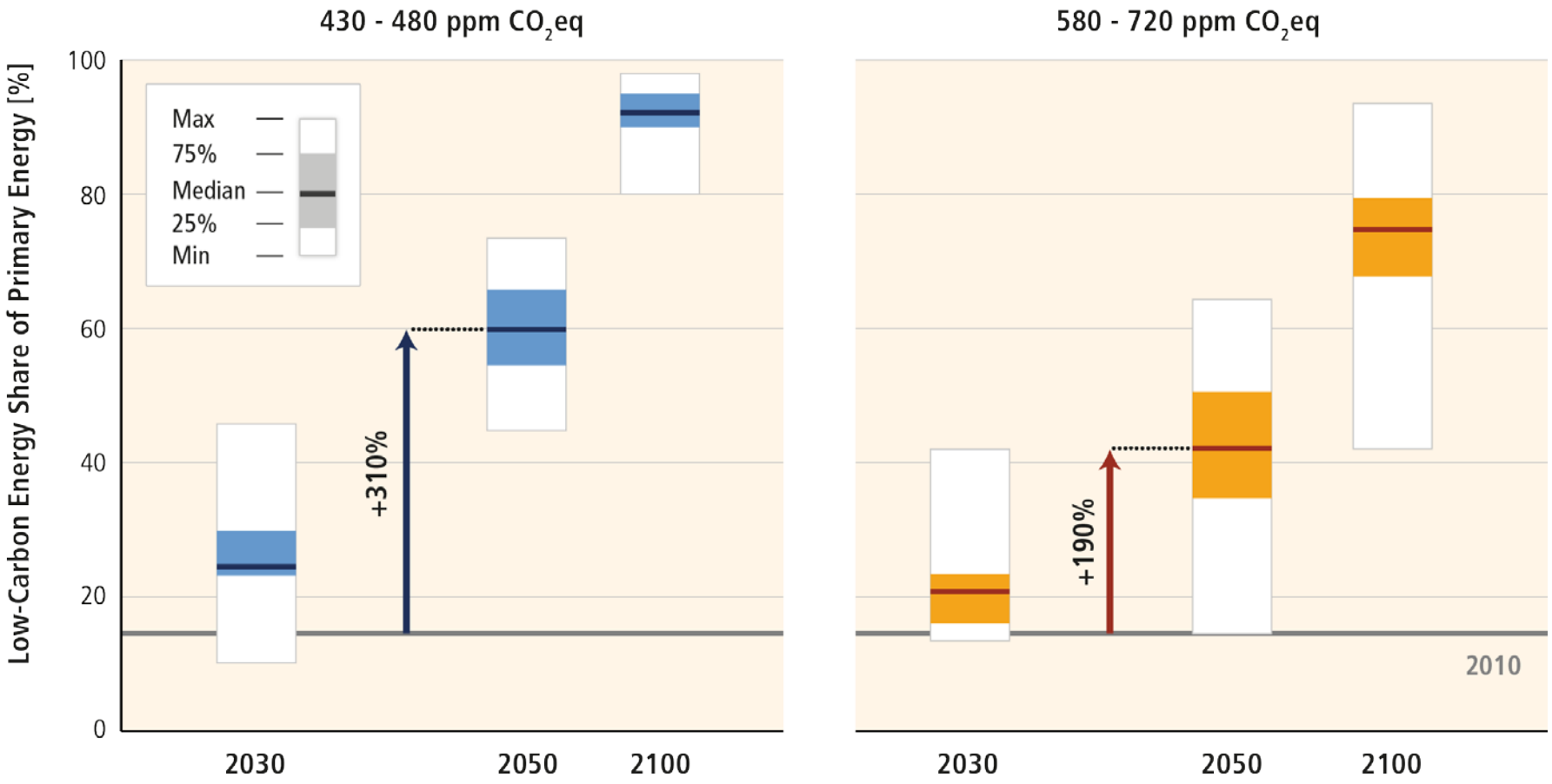
# Additional slides

# Pathways toward zero-carbon electricity, even without nuclear and carbon capture

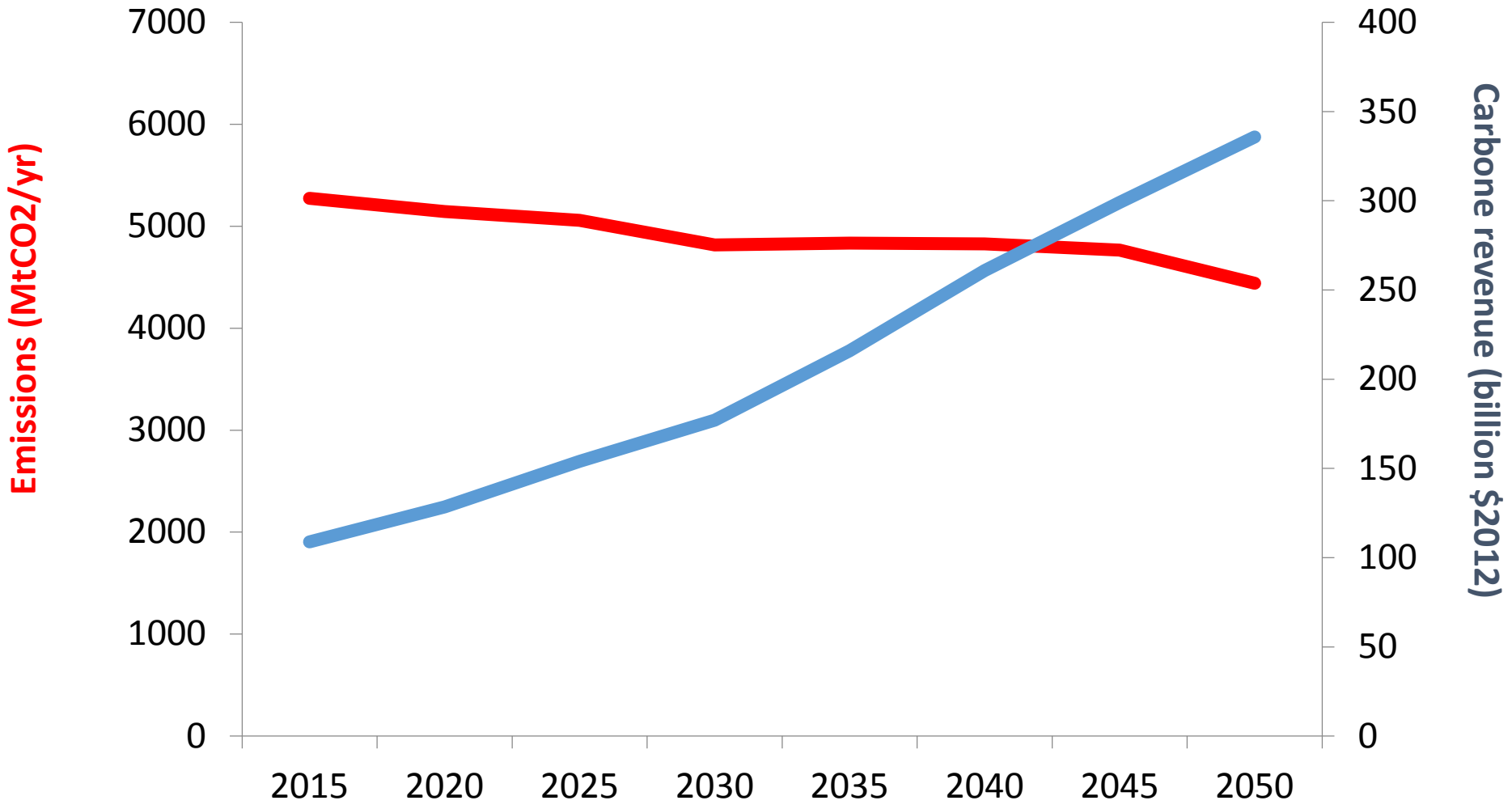


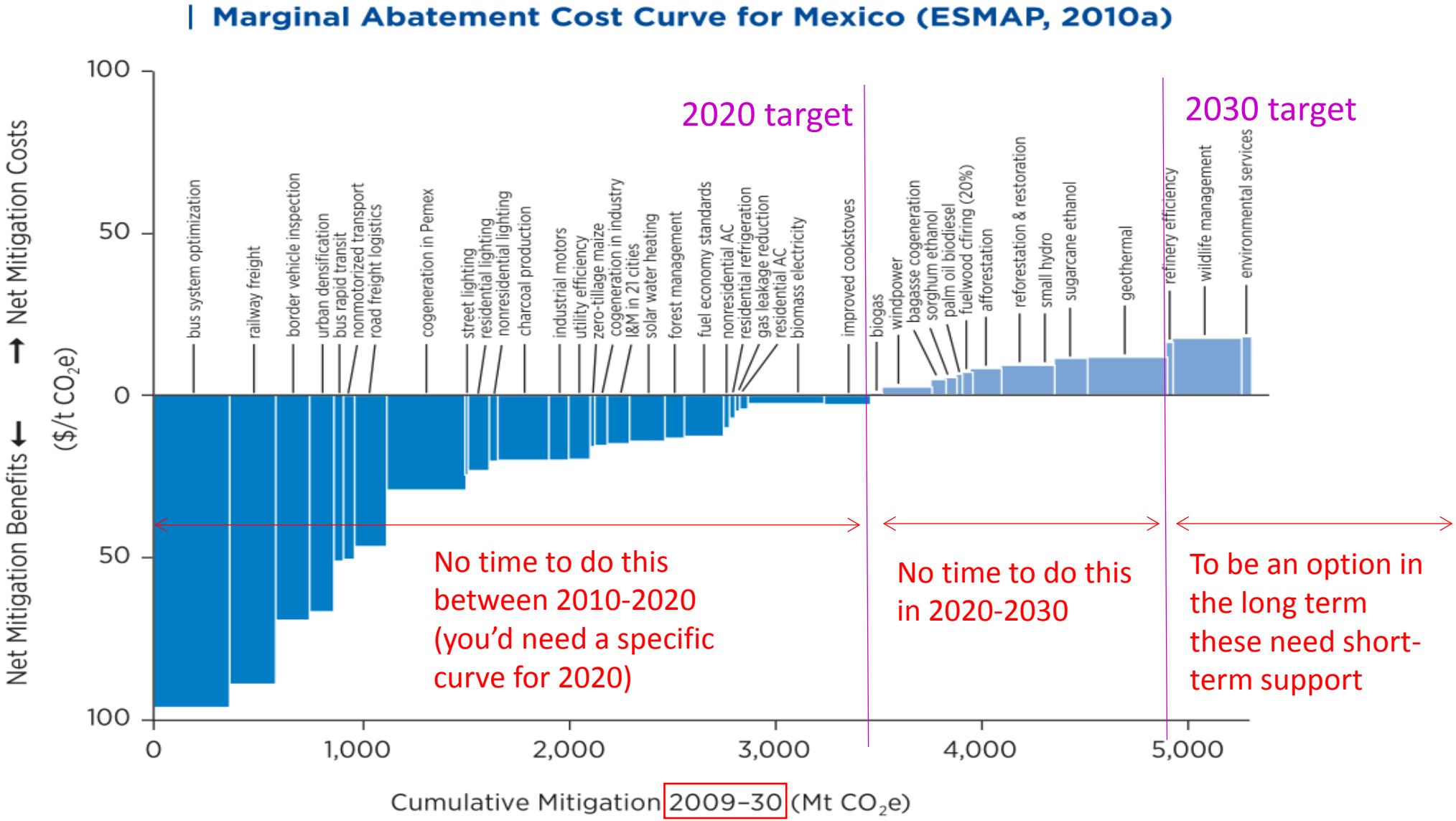
# Carbon-free electricity



# Carbon is a solid tax base – because the carbon price increases over time

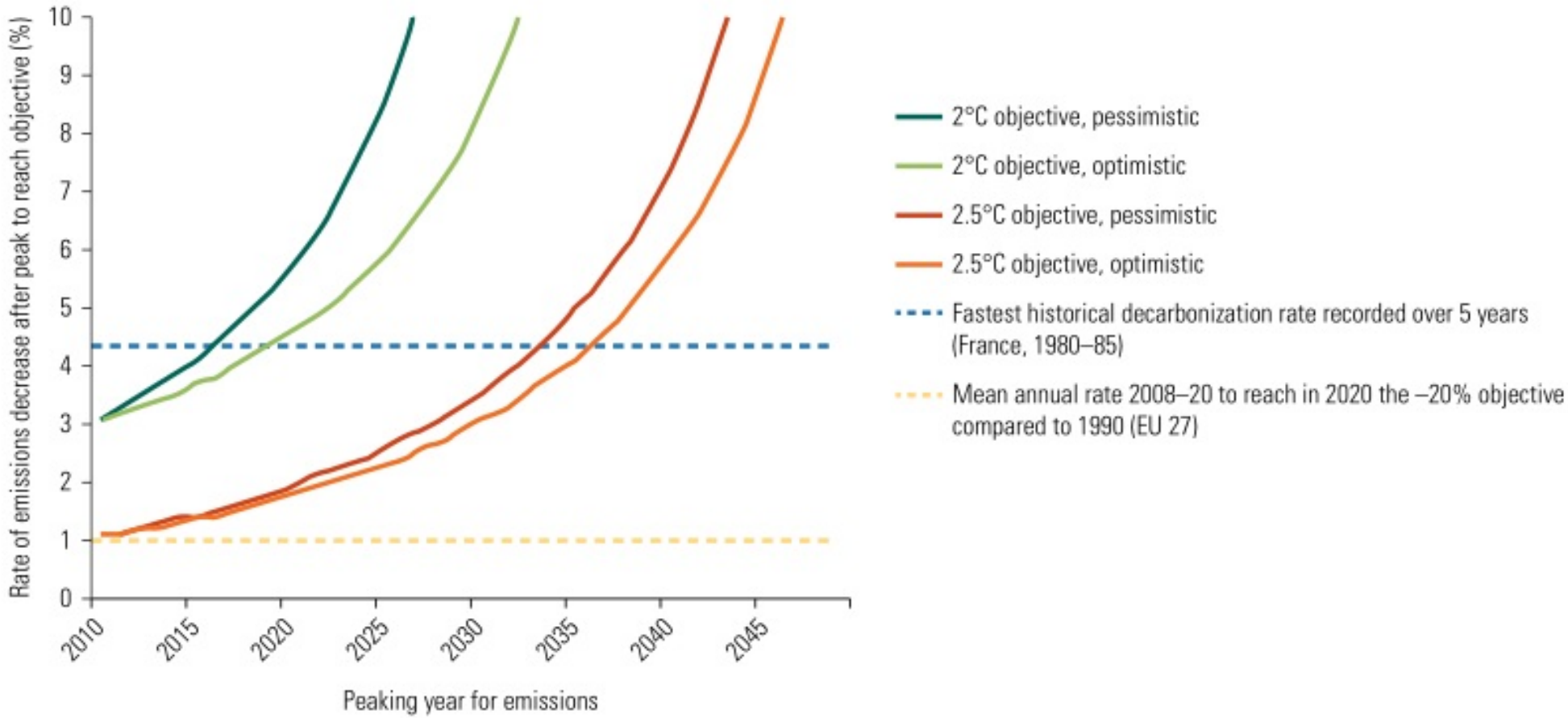


# Reaching a shorter-term target through cheap options (supply curve approach) would cause carbon-intensive lock-in



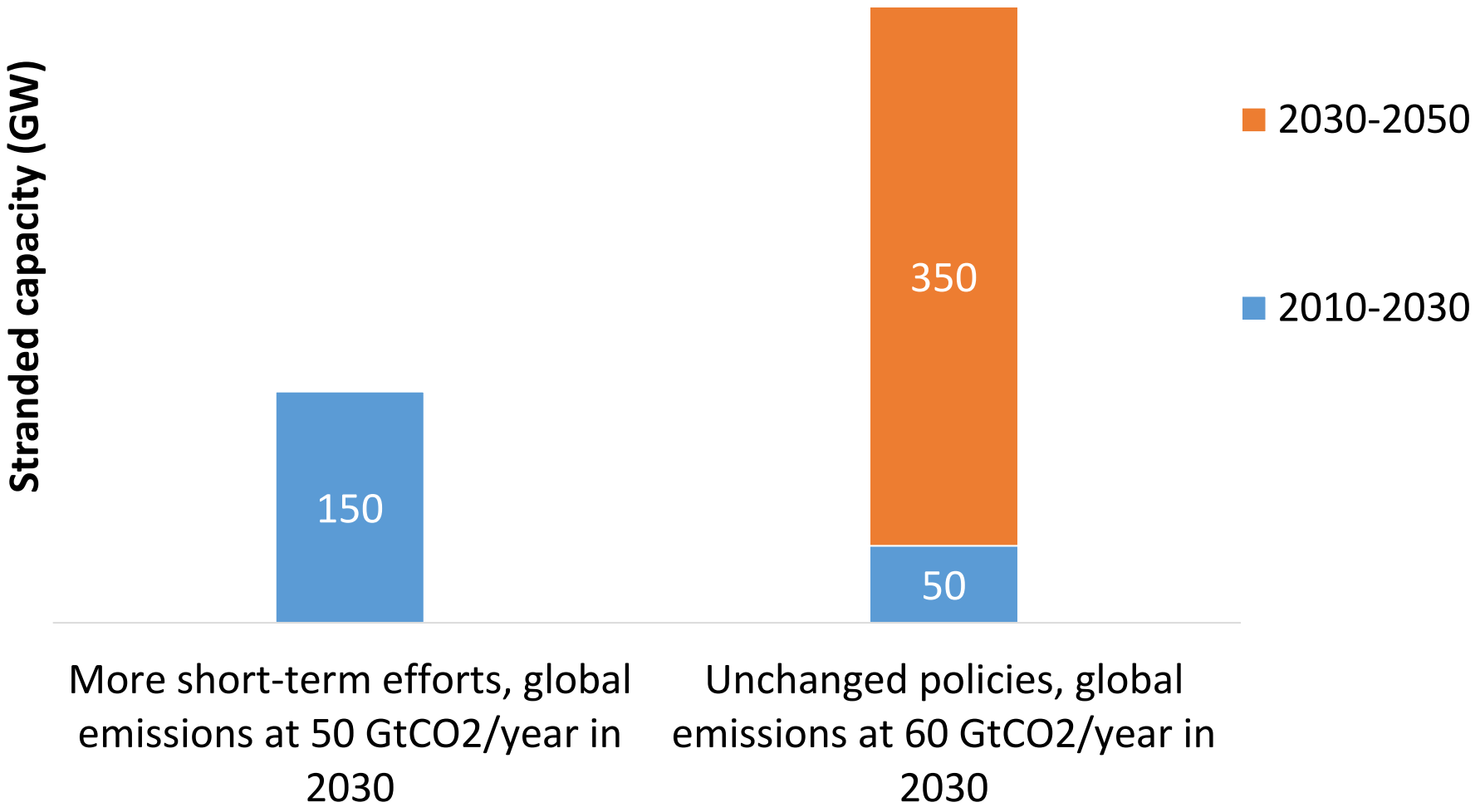

*Source* | ESMAP, 2010b.

**FIGURE 0.1 The Tortoise and the Hare: Not Starting Early Will Entail More Drastic Emission Cuts Later**

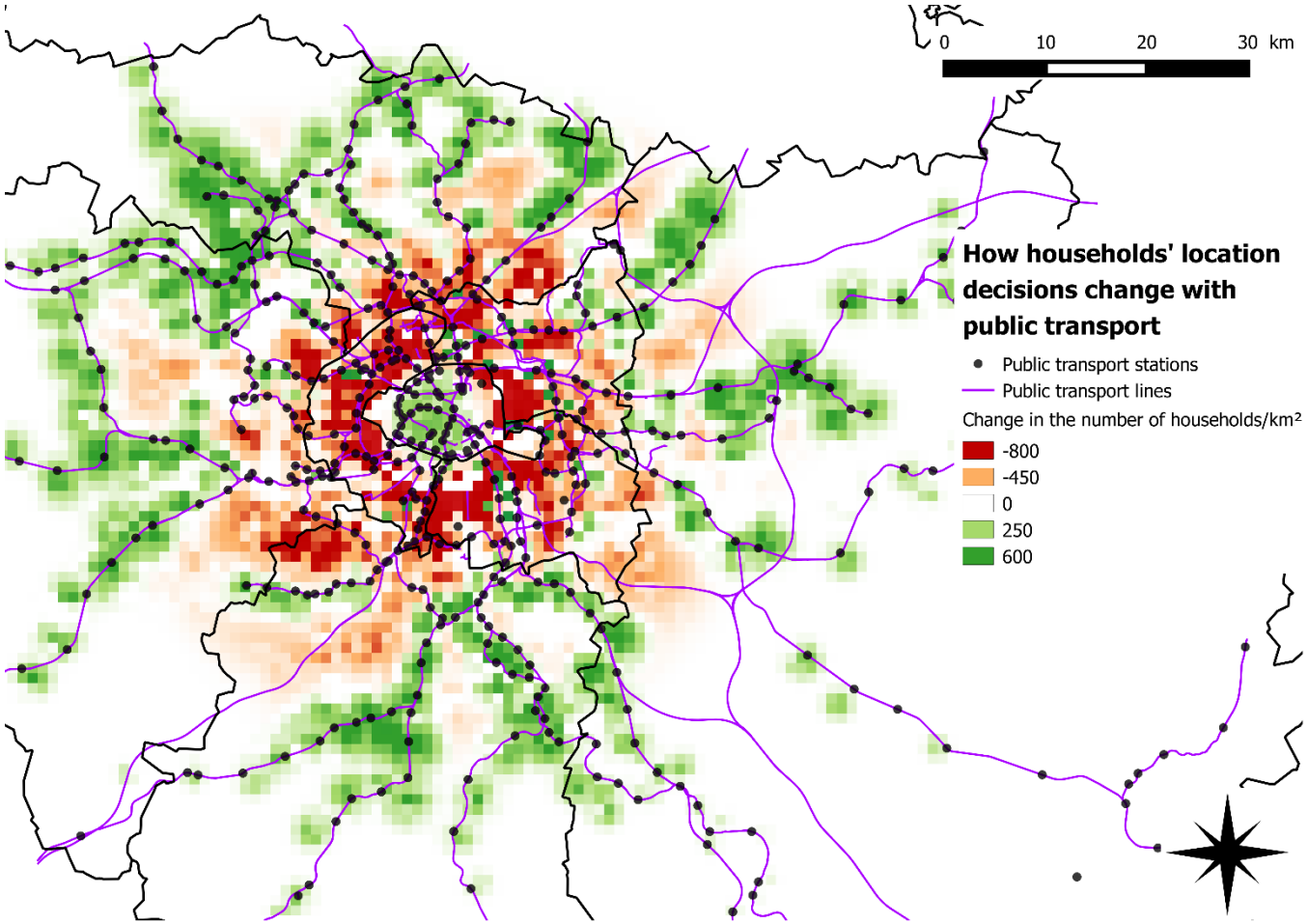



*Source:* Adapted from Guivarch and Hallegatte (2013).

*Note:* Peak year refers to the year in which emissions have reached their highest level and start to decline. Delaying the peak year by just a few years, say from 2010 to 2020, entails increasing the rate of annual emissions reduction from 3 percent to 4.5–5.5 percent. The figure also reports the fastest historical decarbonization rate achieved over a five-year period (outside of periods of economic collapse) and the decarbonisation rate implied by the European Union's commitment between 2008 and 2020. EU = European Union.

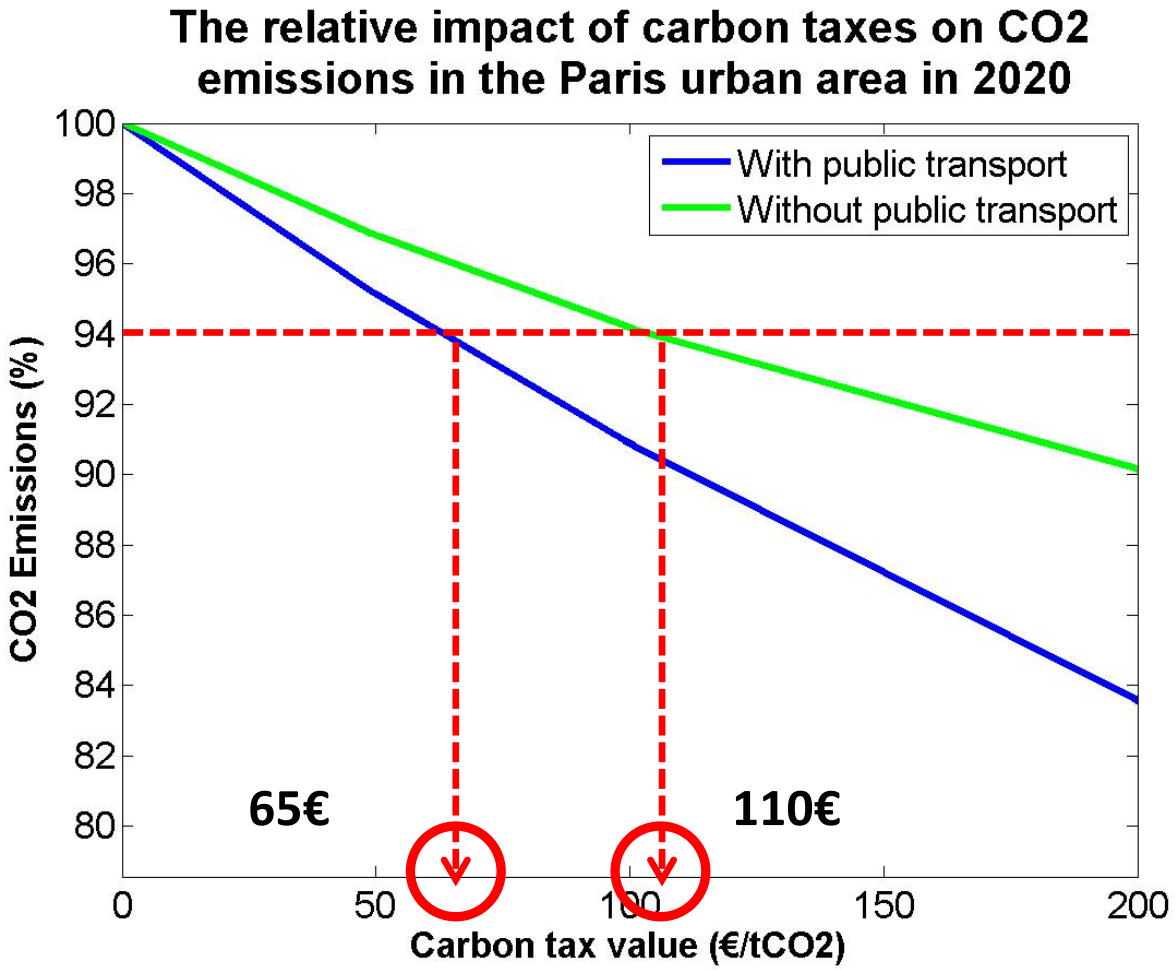

Stranded capacity (GW)
150
350
50
2030-2050
2010-2030
More short-term efforts, global emissions at 50 GtCO2/year in 2030
Unchanged policies, global emissions at 60 GtCO2/year in 2030

# Prices are not enough: develop the right infrastructure




- On a case study on Paris, we find that without the metro system, the Paris agglomeration would look very different.
- Transport would emit twice as much $CO_2$ and a carbon tax would be half as efficient as with the metro system
- Infrastructure financing remains challenging

# A carbon price is twice as effective in the city with public transport…




… it is also probably much more acceptable politically

# Avoid stranded assets